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ABSTRACT

Social thinkers in the United States do not recognize that technology is a result of conscious decisions that directly reflect the social order, and, therefore, have an impact upon American life that goes beyond the technological development itself. The decision by the Federal Communications Commission (FCC) in 1954 established standards for color television systems in the United States that were consciously created by the corporate interests of the electronics industry. The process by which this decision was reached further demonstrates the ways in which technological choices are dominated by the corporate goals of a capitalistic economy, rather than by the needs of the public. Indeed, beyond personal connections, corporate relations among the giants of the television industry have an extensive history. A committee was called together in 1950 to draw up standards for color television that would be compatible with the black and white sets already in use. However, before the color standards were established, the FCC approved a CBS field sequential color system that was noncompatible. The final FCC decision on color standards can be seen as the result of efforts exerted by television industry representatives to increase sales of television sets and to create a larger consumer market for television. What is gained by this integrated examination of an aspect of television history is new insight into the complex manner by which such technology is produced and the extent of its further implications. (HOD)

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CHOOSING A COLOR TELEVISION SYSTEM

By

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ABSTRACT

Raymond Williams, noted British social scientist, has suggested that the technology of a society is the result of conscious decisions which directly reflect the social order. The author here presents an examination of the process by which color television system standards were chosen by the FCC in the early 1950's as an example of Williams' thesis of intentional technology.

It is the particular contribution of this essay that its examination of the process integrates, perhaps for the first time in the study of television history, the perspectives of television as broadcasting, television as technology, and television as business. It also includes new primary data which throw greater light on the impact of corporate behavior and personal relationships upon federal standards-setting.

The British political scientist and student of media culture, Raymond Williams, has pointed out that technology is isolated from its relation to the social structure in modern social thought. As a result, Williams (1975, pp. 13-14) says, we tend to see technology "as either a self-acting force which creates new ways of life [technological determinism] or [as] a self-acting force which provides materials for new ways of life" [symptomatic technology]. Because this intellectual bias exists, American social thinkers do not recognize that technology is a result of conscious decisions: decisions that directly reflect the social order, and, therefore, have an impact upon American life that goes significantly beyond the technological development itself.

Williams (1975, p. 25), viewing television as a prime example of intentional technology, has asserted that radio and television differed from previous communications technologies because they were created primarily as abstract processes of transmission and reception before there was any real concept of what would be the content of those processes. He says, "It is not only that the supply of broadcasting facilities preceded the demand; it is that the means of communications preceded their content." Williams points out further that the manufacturing institutions combined their direct efforts in the sale of sets and their indirect efforts in the supply of money for advertising to determine the shape of broadcasting institutions. As a result, the broadcasting public became from the beginning, "the competitive broadcasting market" (Williams, 1975, p. 35).

A departmentalized scholarly examination of television in the past has significantly contributed to our present understanding of it either as a broadcasting medium or as a technology, and has produced the narrow intellectual bias described by Williams. Even in Erik Barnouw's work,[2] often viewed as the outstanding review of broadcasting history in the United States, there is no discussion of debates within the electronic industry related to the choice of a color system, nor for that matter is there discussion of other technical developments in television. (This is contrasted by the fact that Barnouw does devote significant space to the FM radio controversy between RCA and the inventor of FM, Edwin H. Armstrong.[3]) Such fragmented treatment of the technological aspects of television history, of course, results in little real perception of the total impact that television has upon society.

It is the attempt of this essay, perhaps for the first time, to provide a study of television that focuses upon the choice of a national standard of color television systems from the broadcasting, technological and business perspectives. Through such an examination of a portion of television history, we may see television as the result of economic and social forces which then produce a larger cultural experience.

It is my contention that the decision by the FCC, which in 1954 established standards for color television systems in the United States, exemplified Williams' thesis of intentional technology: that these standards were consciously created by the corporate interests of the electronics industry. I believe also that the process by which this decision was reached further demonstrates the ways in which technological choices are dominated in the United States by the corporate goals of a

capitalistic economy, rather than by the needs of the public.

Repeatedly in this research I asked, "Why color?" There was no concrete answer other than "A picture is not complete without color."[4] But the research and development of color television did not just happen. It did not respond to a public "need," but neither did it respond to a technical "need." What it does seem to have responded to was a marketing "need."[5]

So that we may test Williams' thesis against this process of choosing a color television system, it is important to observe the decision making from its many perspectives: broadcasting, engineering, management.

In reflecting back upon broadcasting in the late forties and early fifties, Robert B. Hanna (1978), former station manager of the General Electric Broadcasting Stations WGY and WRGB in Schenectady, New York, would recall that as broadcasters he and his colleagues saw television as the emerging communication medium for information, entertainment and advertising. In 1978, Hanna would remember that color had been just one of several technical developments that had been on the horizon in the forties. More importantly, technological decisions had not been seen as the concern of GE broadcasters by Ralph J. Cordiner, who became president of that corporation in 1950. He had made it clear to his staff that he felt "broadcasting" should be separated from "television," which he perceived as the manufacture of sets and transmitters.[6]

Those who would write later about the color decision from the broadcasting view would describe it most often as a conflict between Radio Corporation of America (RCA) and Columbia (CBS) color systems (Metz, 1976;

Sarnoff, 1968). In fact, however, an examination of all available information would reveal the situation to be much more complex, involving representatives of the entire television industry and the Federal Communications Commission (FCC), and the result of special competing corporate interests, petty disagreements, corporate ambitions for profits, as well as cooperative industry efforts, extensive interpersonal communication and social systems, and behavior intended for corporate face-saving.

Donald G. Fink, responsible for a good part of the official and unofficial technical accounts of the color system decision, in 1976 would credit the late Dr. W. R. G. Baker, head of the electronics division of General Electric, with leadership and perceptiveness which rose above partisan interests for the benefit of television broadcasting. In 1940, the FCC had asked Dr. Baker to organize the industry in establishing standards for black and white (monochrome) television. Prior to that time, the Radio Manufacturers Association (RMA) had already drawn up some standards for television. There remained disagreement among members of the industry on a limited number of points. This disagreement, it was felt, if not resolved would have led to a chaotic variety of television receivers and transmitters. Therefore, in 1940 Dr. Baker had written to all of the members of the RMA, describing the areas for examination by an industry group to be called the National Television System Committee (NTSC). He requested RMA members who were interested in this decision to select representatives who would participate in the NTSC. They would make recommendations for monochrome television standards to the FCC (Fink, 1976a).

With an eye to protecting General Electric's interests in these significant NTSC discussions, Dr. Baker asked I. J. Carr, general manager of receivers for GE, to be chairman of the panel that would discuss receiver standards. He also asked Conan A. Priest, general manager of transmitters for GE, to chair the transmitter panel. The transmitter and receiver panels were the only ones chaired by GE people, but Baker felt he was placing his men on the more important panels (Priest, 1978).

The entire NTSC organization reflected both the close association of individuals and corporations in the television industry. Priest (1978) would later recall that most of the people on the panels had know each other for years: some had gone to college together, some had been associated in the same company, some who were with RCA had been with GE originally.

Indeed, beyond personal connections, corporate relations among the giants of the television industry had an extensive history. In its earliest days, RCA was the creation of General Electric and Westinghouse. Then, in 1928, GE and Westinghouse agreed to give RCA manufacturing rights and agreed to stay out of radio for the succeeding five years. During that time, Dr. Baker became RCA's vice-president of engineering and reported to David Sarnoff, RCA chairman of the board. Then, on November 21, 1932, a consent decree was signed in the case of the RCA-GE-Westinghouse monopoly suit. GE and Westinghouse withdrew from the RCA and NBC boards as a result of the decree; NBC became the wholly-owned subsidiary of RCA; GE and Westinghouse retained their broadcasting stations, although they were managed by NBC. In spite of this readjusting of relationships, at the time of the first NTSC in 1940, GE and

Westinghouse still owned RCA stock (Priest, 1978).

Baker's connections with William Paley, chairman of CBS, were extensive as well. The Columbia Broadcasting stations were principal users of GE audio broadcasting equipment, black and white and later color television transmitters, and studio equipment. It was agreed between Baker and Paley that General Electric would give sales preference to the CBS stations, and that Columbia would promote the use of GE equipment as much as possible (Priest, 1978).

In spite of these corporate and individual relations which produced some cooperative spirit among NTSC members, Donald Fink (1976, p. 1324) would later report that the first NTSC had also operated "amid pressures from organizations that had vested interests, in patents and markets, to protect," and that the NTSC had been called because of "contesting ambitions and conflicting technical opinions in the power structure of the industry" (Fink, 1976, p. 1326).

RCA, following the earlier RMA committee standards, in 1939 had jumped ahead of FCC approval of standards, and built and sold television receivers. Philco, Zenith and DuMont had objected to this, and also took issue with certain technical features of the standards.[7] In response to RCA's premature action in 1939, the FCC had said that it would not authorize the limited commercial broadcasting taking place at that time until the "engineering opinion of the industry is prepared to approve any one" set of standards for television monochrome systems (Fink, 1976, p. 1326).

The NTSC, therefore, then proceeded to resolve these differences at its meetings held between July 31, 1940 and March 8, 1941. Chief among

disagreements at the first NTSC meeting in 1940 were the number of scanning lines established for television receivers (simply stated, scanning lines of light produce the television picture: the larger the number of lines, the sharper the image), and the use of frequency modulation (FM) for television sound (because FM sound is static-free, it transmits a clearer signal than does AM sound). As a result of a compromise between RCA and GE, 441 lines were recommended and agreed to also by CBS. It was then established as the NTSC standard, although this number was changed later to 525 lines at the final meeting of NTSC in 1941. (This was a compromise between Philco who wanted 800 and RCA who wanted 441 [Fink, 1976]. As Fink would later report it [1976a], Dr. Baker asked him to select a compromise and for various technical reasons he selected 525 lines.)

Discussion over use of FM sound for the television system was also heated because of RCA's ongoing conflict with Edwin H. Armstrong, inventor of FM. Nevertheless, the force of all of the other NTSC members in support of FM which produced static-free sound overruled RCA (Priest, 1978).

The FCC accepted the NTSC recommendations for monochrome television standards, and the first NTSC adjourned July 1, 1941 (Fink, 1976a, p. 1327).

Following World War II, attention turned to development of color television. "On Dec. 9, 1946 the Columbia Broadcasting System petitioned [FCC] for immediate commercialization of color television on a wide-band basis, using the ultra-high-frequency (UHF) channels" (Fink, 1955, p. 71). This was a system designed by Peter Goldmark and his associates at CBS.

At the same time, RCA recommended a color system to the FCC that used monochrome standards of 525 lines and 60 fields, and was sent on a simultaneous basis. It had been developed by R. D. Kell and others at RCA Laboratories. As with the CBS system, RCA "made no provision for the transmission of color programs by the stations then inhabiting the very-high-frequency (VHF) spectrum" (Fink, 1955, pp. 7-8). The FCC rejected the RCA system, and denied the CBS petition in March 1947.

For a short time, the use of VHF or UHF channels was the focus of intense industry discussion. In 1946 and 1947, all color television proposals involved UHF rather than VHF. CBS intended to broadcast color over UHF, and William Paley, chairman of the board of CBS was so convinced that the FCC would approve the CBS color system in its early 1946 petition, that he refused to acquire some VHF television stations that became available. Later, after the first FCC turn down of CBS color, Goldmark modified the system for CBS (Metz, 1976).

Baker was highly concerned that color be transmitted on VHF, since the General Electric television stations were on VHF (Hanna, 1978). By January 1949, a total of 107 television stations were already in operation on the VHF band. It was recognized that the twelve channels on that band would not be enough for the developing medium, that UHF would have to be opened for more monochrome and not saved for color. Thus, by 1949 research and development of color television "had shifted to systems designed to be compatible in the frequency sense as well as in the scanning sense," while at the same time companies such as GE, responding to the FCC's insistence on opening the UHF bands, looked to expand to UHF as well (Fink, 1955, pp. 7-11).

Raymond Williams (1975), in analyzing television, would point out in the seventies that early broadcasting networks were of secondary importance to their owners who were primarily in business for the production and sale of sets. Robert B. Hanna (1978), former manager of GE stations WGY and WRGB, confirmed Williams' point by commenting that Dr. Baker had been interested primarily in the sale of sets and transmitters, and was much less concerned with the broadcasting stations. That end of the corporation was perceived by GE as "pretty small apples."

In 1949 when the FCC hearings on color systems began, there were over 2,000,000 black and white television sets in use by the public, and they were increasing in numbers by about 400,000 sets per month (Fink, 1955). The second NTSC was called together in January 1950 by Dr. Baker to draw up standards for color television that would be compatible with the monochrome sets already in use (compatibility would allow people to receive color programming on the same sets on which they were already receiving black and white programs). The work of Color Television Inc., RCA and others in developing a compatible color system was a sign to those in the field that such a system could be completed in a "reasonable" period of time. For this reason, they tried to convince the FCC to wait to make its decision (Fink, 1976a, 1955).

While the first NTSC had been suggested by the FCC, the second NTSC was called in spite of severe resistance toward it by the FCC (Fink, 1976a). In October 1950, after the second NTSC had been convened, but before it had achieved its goal to establish color standards, the FCC approved the CBS field sequential color system developed by Goldmark and his co-workers at CBS Laboratories. The CBS system was noncompatible,

and although television industry engineers tried to advise the FCC to wait for a compatible system, Donald Fink (1976a) wrote later that "FCC Commissioner R. F. Jones [greeted this advice] with suspicion that these engineers were in conspiracy against the public interest."

In a technical publication on color television at the time, Edward M. Noll (1951) described the CBS system and the FCC decision favorably, and pointed out that the CBS system excelled especially in color fidelity, registration and convertibility.

Up until 1978, accounts of this first FCC color decision would describe it simply as a result of technical presentations. Twenty-five years after the second NTSC, however, Conan A. Priest would throw new light on the impact of corporate attitudes and behavior, as well as the effect of delicate personal interactions upon federal standards-setting.

> About 1947, CBS developed this system of color discs, they didn't think it was any good and didn't want to go ahead with it, but the head of the FCC at the time . . . got mad at RCA because he tried to get a major job with RCA and they turned him down. . . . This chairman of the FCC insisted on Columbia presenting their story, so Goldmark did. . . . Goldmark admitted to us privately that he just hated like the devil to present it, and wasn't intending to present it at all, but the FCC required him to. . . . Sarnoff made a mistake of shooting off his mouth . . . and that antagonized the FCC. . . . He talked about the inability of the FCC to make up their minds, and things like that. [If he'd kept quiet] I don't think they would have done this, but anyway, as a result of all that happened, they approved the Columbia system. (Priest, 1978)[8]

Following the FCC decision in favor of the CBS system, RCA appealed to the U.S. Supreme Court, which ultimately upheld the FCC. CBS then made its first commercial broadcast of color television carried by CBS network facilities and broadcast in Washington, Philadelphia and Boston, and began regular daily colorcasting June 25, 1951. This broadcasting of color programs ended, however, on October 19, 1951, just four months later.

CBS had requested materials for production of receivers from the Office of Defense Mobilization, but was refused them because of military demands of the Korean War for materials and manpower. CBS, therefore, announced in October that because there were not enough color receivers, public color telecasts would stop (Fink, 1955).

Meanwhile, the work of the second NTSC proceeded. CBS did not participate in the early NTSC color panels of that second committee. Priest, chairman of the transmitter panel, explained that the NTSC was emphasizing the importance of a 525 line color system that would be compatible with the existing 525 black and white system. The CBS people admitted frankly that they wished to present their own system, but at the same time they did not seem confident that it was sufficiently good. As Priest (1978) would remember, Goldmark believed that "it was better to stay out of NTSC than to be a dog in the manger."

RCA and GE had worked closely on the earlier development of the color system that used a three-cathode tube. Priest (1978) would say that in spite of the chilliness by FCC administrators toward the system "We [NTSC] convinced the engineers on the FCC that what we had was good and sound, and they backed us up on it."

Further development of color was needed, however, and so Dr. Baker reorganized the NTSC in the Spring of 1951. During the next two years, ten NTSC panels conducted extensive and intensive investigations into the many technical aspects of the new color system, and finally produced (by unanimous vote, including Goldmark) the twenty-two signal specifications which became the foundation of color telecasting in the United States (Fink, 1955).

The report of the NTSC was made in two parts to the FCC in 1953. The first part was a petition recommending the adoption of NTSC standards. The second part was a demonstration held October 15, 1953 at the Waldorf-Astoria Hotel in New York City. Cooperating in the demonstration were NBC, CBS and DuMont, the three television networks of that period. Television receivers produced and demonstrated by Admiral, CBS-Columbia, Crosley, Emerson, General Electric, Hallicrafters, Hazeltine, Motorola, Philco, RCA, Sylvania, Westinghouse and Zenith were used. The FCC accepted NTSC's recommendations, and the second NTSC was officially disbanded February 4, 1954 (Fink, 1955).[9]

It becomes increasingly clear, in a review of the many events contributing to the final choice of color television standards, that Williams' contention is supported that television is technology intentionally created out of the conscious needs of a social order. In fact, the final FCC decision on color television standards can be seen to be the results of efforts exerted by television industry representatives to achieve notable success in the sale of television sets and to create a larger consumer market for television,[10] rather than to answer a recognized need for the existence of color television for any other specific reasons. Williams (1975), indeed, indicates that "as late as the introduction of colour, 'colourful' programmes were being devised to persuade people to buy colour sets." These programs came, however, after the fact. The technology was intentionally created, then came the content.

The corporate executives and their counterparts in the FCC appear to have exerted their efforts toward an ultimate goal of television sales. Williams (1975) writes that "consumer durables" such as the car,

appliances and radio sets had been the "applied technology of a set of emphases and responses within the determining limits and pressures of industrial capitalist society." Color television appears to have been a 1950's application of the determining limits and pressures of that same industrial capitalist society.

Beyond this demonstration of Williams' thesis of intentional technology, it is important also to recognize the impact of television upon the shape of American life, for it goes significantly beyond the technology itself. Once created, the technology has the capacity to act back on those who have created it. Thus, as we sought to exist in an American color television milieu in the 1950's, we felt increasing pressures upon us as consumers. We were told "Blondes have more fun," and this concept gave sudden thrust to the cosmetic industry; white shirts and white sheets photographed poorly in color: enter colored shirts and bed linen; and laundry detergents that once only made our white clothes whiter, now also made our colored clothes brighter.

Space does not allow for an extensive discussion of this result, but mention must be made of the ironic full turn taken by color television technology when its affect was felt finally by the military-industrial complex which had given it birth. This occurred when, in the 1960's, all Americans could see "in living color" the blood of GI's and Vietnamese alike. Then the battles of Vietnam came into our lives with a force of reality greater than ever before, and gave further impetus to a growing anti-war movement.

What is revealed by this integrated examination of an aspect of television history is new insight into the complex manner by which such

technology is produced, and the extent of its further implications. It is a dialectic process in which the social and economic structure of society shapes conscious technological decisions, thus creating form which in turn effects content. This content then becomes another force which has further impact upon the social structure itself.

NOTES

[1]The author wishes to thank all those gentlemen, pioneers of the television industry, who so graciously extended their time and remembrances to provide the bulk of new information in this paper. Interpretation and analysis of the data, however, except where noted, are the sole responsibility of the author.

[2]Barnouw does not cover the color decision in his A History of Broadcasting in the United States, Vols. 2 or 3 (New York: Oxford University Press, 1966-70) or in Tube of Plenty (New York: Oxford University Press, 1975). I tried to reach Barnouw to question this omission on Nov. 26, 1978, he was in India and would not return until June 1979.

[3]In Tube of Plenty, Barnouw points out that RCA saw FM as threatening AM radio, which was providing the funds for development of television. Sarnoff strongly influenced the FCC, Barnouw says, and so when Armstrong first applied for an FM experimental station, the FCC denied it, but later approved it. Armstrong committed suicide in despair after a long and dragged out struggle with RCA for patent rights. After his death, the court awarded in his favor.

[4]I have been reminded by a reader that, in fact, color plays a significant part in our very existence, that our clothes are colorful, our homes are colorful, and that, the production of color in television viewing would have been seen as natural as a reflection of reality. My contention, however, is that for the most part colors elsewhere than in nature did not play the same role in our lives as they did following the introduction of color television. I contend that for the masses ours

was a world of colors that lacked vividness, and that our clothing, our decorations, etc., were dominated by blacks, greys, navies, browns, beiges, and pale pinks and blues. The main exception to this was bright red, which was consistently present in fashion and cosmetics. A comparison of the range of crayon colors available before the mid-fifties and since then points to a possible change in American consciousness toward color. It, however, remains to be seen whether this may or may not have relevance to our discussion here.

[5]The marketing "need" here is a material need (such as color television) that is built upon a psychic need (such as keeping up with the Joneses, demonstrating affluence, being modern, etc.) and added to the already demonstrated response by the public to technicolor films, colored photos, etc. The suggestion here, therefore, is that the need to have color television was a product of marketing and advertising techniques that created that need based on already identified psychic desires of consumers (much in the same way that the Coca-Cola ad campaign was built on a desire to stay young and the dynamics of a "youth cult").

[6]In addition, in a personal communication with Willard Purcell on the same day, he told me "Broadcasting started out under the manager of the old publicity department [at GE broadcasting stations WGY and WRGB, Schenectady], and it wasn't until the 1960's that broadcasting was moved to the electronics group."

[7]Barnouw, in Tube of Plenty, describes Sarnoff as a hard fighting, company man. Other examples of his aggressiveness include hiring away an FCC engineer suddenly in 1936, who became an RCA executive during the RCA fight with FCC over TV. Also, in October 1947, Charles Denny, FCC

chairman, resigned after the FCC decision, and became an NBC vice-president and general counsel (pp. 81, 100).

[8]In contrast to our discussion here which focuses on corporate impact on these decisions, Ben H. Bagdikian, The Information Machines (New York: Harper and Row, 1971) Ch. 11 posits the impact of the FCC itself upon such decisions. C. Wright Mills, of course, presents a theoretical perspective that is to the point in describing the interrelationship of government and private economic interests, as is exemplified in the choice of a color television system. See C. W. Mills, The Power Elite (New York: Oxford University Press, 1956).

[9]Hurt feelings fade slowly, it seems, and so even into the 1970's there would be echoes of the corporate and personal conflicts entailed in the color decision. As Robert Metz would describe it (Reflections, pp. 154-160) the color conflict was primarily a contest between RCA and CBS, with some involvement by DuMont. Metz would say that opponents to CBS's spinning discs system grossly exaggerated the shortcomings of the CBS system, both in words and physical demonstrations. Fink would present two other comments on the CBS system: "The harsh verdict, returned by its competitors, is that CBS wanted to delay the rapid growth of the monochrome service so as to gain time to strengthen its competitive position. The kinder verdict, to which this writer inclines, is that Dr. Goldmark and his management correctly foresaw the coming of color television, and pressed for the adoption of the incompatible system because they knew of nothing better" ("Perspectives," p. 1328). Of course Priest has cast further light on this controversy in these pages (see p. 10 above). While RCA would be represented in most

literature on broadcasting as the developer of the compatible color system adopted by the FCC, Fink would point out that although RCA made a major contribution toward development of a compatible color system, there were essential parts of the system that came from Hazeltine, Philco and General Electric ("Perspectives," p. 1329). This fact was embodied in Standards, edited by Fink, and was not favorably received by E. W. Engstrom, one of the vice chairmen of the NTSC, who would later be president of RCA. Fink told me (Nov. 18, 1978) that "Mr. Engstrom insisted on having a specific disclaimer [inserted in the book's preface] because in his opinion it [Standards] did not give full and whole credit to RCA and was in fact--just didn't say who did what." These intra-industry conflicts have no end, it seems, for in the 1976 edition of the Encyclopedia Britannica section on television (Vol. 18, pp. 105-123) written by Fink, there is no reference to the RCA contribution to color television (in spite of the fact that Fink, in our conversation of Nov. 18, 1978, credited them with 90% of the development), although the early CBS research is mentioned. Fink told me, "I was told by the editors of the encyclopedia they would prefer that I stay away from company affiliations as much as possible."

[10]According to Conan A. Priest, in our conversation of Nov. 22, 1978, extensive PR campaigns were waged by GE, Philco, and Zenith, along with RCA, to influence a positive attitude toward color TV by the public.

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